

## REMARKS

The first issue raised is that the Product type claims 1, 4-10 and 20, have been rejected under 35 U.S.C.102(e) as being anticipated by or in the alternative under 35 U.S.C. 103(a) as being Obvious over Laine et al. 6,551,960.

The basis of the Obviousness attack seems to be the alleged teaching in "columns 2-4 and 8 of Pt and Ru on a support, with nanosized metal clusters", and further that "the overlapping size of column 8 renders the claims unpatentable".

To support his position, the Examiner specifically points to columns 2-4 and 8.

In reviewing these portions of the reference, in columns 2-4 it is apparent that only some general references are made to nanoparticles. In fact, the specific discussion of particle sizes are all for particles in the much larger micron size range (one micron is equivalent to a 1000 nm).

In column 8, the only nano-size particle that is mentioned is at line 4 ie. < 100 nm. At line 66, a range of 1-10 microns is mentioned, which is orders of magnitude larger than our claimed particle size range.

The Examiner's attention is directed to col. 6, line 40, where the only other specific mention of "nano-size" particles in the reference is found, i.e., a range of 50-100 nm. Accordingly, in the absence of any other way and means of determining what is meant in the reference by "nano-size" particles, it must be concluded by a person skilled in the art that when the reference mentions "nano-size" particles, it must be in the range of 50-100 nm, which is five to ten times larger than our claimed particle sizes. It should be noted that significant particle size effects only come into play at less than 10 nm.

Clearly, there is no overlap in this particle size range, as the Examiner alleges.

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Moreover, there is no teaching or suggestion in the reference of particle size control. In fact, it is very clear that the process described in the reference (see the examples) has no way or means of controlling particle size. In our invention, the particle size and control thereof is determined by the pH. For example, see our Specification Table 1 on page 12.

Regarding the Pt:Ru composition, the Examiner refers to the range taught in column 2. We stand by our position that the broad composition ranges disclosed are simply not enabled. In fact, the Pt:Ru ratios are only disclosed in terms of **total metal loads (emphasis added)**, rather than individual component compositions as recited in all of our product type claims.

In our last response, we pointed to the fact that since the Examiner admits that "the catalyst is not identically described", there can be no Anticipation. However, the Examiner has maintained the 102(e) rejection, apparently since "no differences are seen due to the similarity of the methods". As mentioned above, the inclusion of pH control alone, distinguishes our process and provides the particle size control, which differentiates our products from Laine.

Accordingly, the reference does not disclose either the defined selected Pt:Ru ratios (which the Examiner admits) or the defined controlled nanoparticle size range.

The Examiner dismisses our arguments and maintains that "Laine et al clearly teaches Ru/Pt bimetallic catalysts and has an extended discussion of particle sizes of the metals and indicates that they can be of the present size." The Examiner further states that this contention is enabled, since "Laine also has XRD photos as is enabled".

As we pointed out in the last response, there are **no** XRD photos in the Laine et al reference. The Examiner is invited to review the reference and our previous arguments in this regard.

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Further, it is submitted that at col.9, lines 4-6, Laine admits that the SEM images of the nanosized particles were poor as expected, since resolution is poor below 0.5 microns. As pointed out in our last response, it is well known to those skilled in the art that TEM images are the conventional means of providing the needed resolution required for nanosized particles measurement, and they simply are not present in the reference. Regardless, as pointed out above, it is apparent that the nano-size range contemplated by the reference is in the 50-100 nm range.

Moreover, it is generally accepted by those skilled in the art that TEM is the direct technique to measure particle size in the nanometer range ( $< 10$  nm). XRD gives an average measurement and the results can be influenced by other properties of the catalyst such as e.g., lattice strain. (FE)SEM gives morphological information, however, it is difficult to distinguish the catalyst from the substrate.

Further, regarding the 102(e) rejection based upon overlapping particle size ranges, the Examiner's attention is directed to the recent Federal circuit case of *Atrofina v. Great Lakes chemical corporation*, No. 05-1359 (Fed. Cir. March 23, 2006). The holdings included that anticipation is not sustainable based on overlapping parameter ranges. Specifically, that the claimed oxygen/methylene chloride ratio of 0.1 – 5.0 % was not anticipated by a reference disclosure of a ratio of 0.001 – 1.0 % because (i) the entire claimed range was not described with sufficient specificity, (ii) the lower end of the ratio in the reference differed by a factor of 100 from what was claimed, and (iii) that the disclosure of a 0.001 – 1.0 % range was not a disclosure of the end points of that range. The Examiner will appreciate the analogy to the present fact situation, and accordingly, we respectfully request withdrawal of the 102(e) issue.

The Examiner further submits that "no difference is seen in the metal phases and experimental data should be presented."

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For clarification purposes only, we have removed reference in our claims to "structural formula" and replaced it with -- composition --, since the nanoparticles may in some cases comprise a multi-phase composition including (non-alloyed) forms of both metals in addition to a PtRu alloy phase.

As for the experimental data, our Specification contains several general examples of the product phases. See p. 4, line 19 to p. 5, line 12. (as per claims 4, 6 and 20) Also, both figures 6 and 7 are specifically directed to a single phase Pt/Ru alloy phase of 85:15 atomic Pt:Ru % composition. A new claim 22 has been added directed thereto.

Next, the Examiner has raised a new issue, namely, the rejection of all of our claims 1, 4-15, and 17-21, under 35 U.S.C 103(a) as being unpatentable(Obvious) over Laine taken with Wang.

The Wang reference is acknowledged in our Disclosure.

It is curious to note that all of the Examiner's specific comments on this rejection are solely directed to the method aspect of the invention, which in fact is restricted to claims 11-15, 17-19 and 21. Accordingly, clarification from the Examiner of this issue in respect of the remaining product type claims is required.

The Examiner continues by admitting that Laine does not teach the synthesis.

The Examiner further alleges that "Wang teaches on pg 1623 in particular how to make Pt, Ru nanoparticles using ethylene glycol and alkali."

As stated in the Wang Abstract, in the process disclosed, the pH is adjusted using NaOH, to separate the Pt nanocluster as a precipitate from the glycol solvent. Apparently, the Examiner is of the opinion that since NaOH is added, it is inherent that this is achieving particle size control.

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In fact, this is not the case. There is no teaching or suggestion in the reference of particle size control by pH adjustment. Furthermore, on page 1624, column 1 in the illustrated chemical reaction, it is noted that the pH is greater than 12. Also, at the bottom of column 1 to the first paragraph of column 2, it is noted that if the pH is less than about 12, instead of the metal colloidal solution, a precipitate was obtained during the heating process. That is, a precipitate is formed prematurely.

In our claimed pH range, there is no premature formation of precipitate, and we achieve particle size control by varying the pH by the addition of varying amounts of NaOH and hence the pH in the range of 12 to 8. Accordingly, the process described in Wang is not the same!

The Examiner's attention is directed to the statement which follows this in column 2. That is....the obtained Pt nanocluster in glycol is very stable when the pH is adjusted to a value higher than 7. The only way to rationalize this statement is to replace the incorrect number "7" in their paper with - 12 -. If this is done, the sentence agrees with the preceding sentence and the illustrated chemical reaction in column 1.

Moreover, particle size control is achieved by Wang by varying the amount of water. See pg 1625, column 1, under the heading "Influence of solvent..." . Accordingly, since NaOH is already part of the Wang process as acknowledged above, they found it necessary to use other means to achieve particle size control. This teaches away from any suggestion that NaOH is used in Wang for particle size control. In any case, Wang's pH is clearly above 12.

In his concluding statement, the Examiner notes the discussion in our Specification of the lack of relevance of Wang, and further notes that our claims do not exclude the features argued as necessary in Wang. It is not clear to Applicant as to what "features" the Examiner refers. As mentioned above, Wang uses alkali to raise the pH above 12, which is outside of our

claimed pH range. This clearly distinguishes our process claims from Wang and/or a combination of Laine and Wang.

Regarding our claimed products, neither Laine nor Wang disclose our specific claimed chemical composition (Wang being restricted to single metals), or the claimed specific combination of chemical composition and particle size.

Accordingly, the Examiner is requested to withdraw this issue respecting the process claims, and to either withdraw the issue respecting the product claims or make a case for the Obviousness thereof.

Finally, in another new rejection, claims 1, 4-7, 9, 11-15 and 17-21 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Hoster article taken in combination with Wang.

It is noted that claims 8 and 10 are not part of this rejection.

Specifically, the Examiner alleges that Hoster discloses at pg 498 Pt/Ru of 75:25. The Examiner further admits that Hoster does not teach the particle size, and alleges that Wang teaches the synthesis of Pt and Ru nanoparticles.

We have already established above that Wang does not disclose the same synthesis as ours.

Further, it is respectfully submitted that the Hoster reference relates to the use of preformed metals including some PtRu alloys, for purposes remote from the present invention is a comparison of smooth versus rough surfaces.

The preformed metals are specifically described at page A497, column 1 under the heading "Electrode samples", where it is stated that "all samples were

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mirror polished disks....purchased from Johnson Matthey". Clearly, these materials are not in particulate form as in our claimed invention, which renders the described alloy compositions moot.

Accordingly, it is further submitted that Hoster represents non-analogous prior art, not properly combinable with Wang to establish a prima facie case of Obviousness.

Even if the combination was proper, which it is not, the mere fact that Wang fails to disclose the method of our invention overcomes the Obviousness issue.

The Examiner is therefore requested to withdraw this issue, and to allow all of the claims in this application.

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